## **EOSC105 NATURAL DISASTERS\_F20 / STUDY GUIDE FOR EXAM 2 (Monday Oct. 19)**

## **SUBJECT TO REVISION (3 pages)**

**EARTHQUAKES:**

* Helpful information:[**https://open.oregonstate.education/earthquakes/chapter/earthquake-basics/**](https://open.oregonstate.education/earthquakes/chapter/earthquake-basics/)

**Be familiar with the following**:

* What are some **hazards associated with earthquakes**?
* Focus and Epicenter:
* Elastic rebound theory:
* Seismic tomography:
* Seismogram:
* What is the difference between P and S waves (body waves)?
  + Where do seismic waves (body waves) originate?
  + How do P and S waves help us understand Earth’s internal structure?
* Surface waves --how are they different from body waves?
  + Which are high frequency vs low frequency waves?
* How do the following respond to high frequency vs low frequency waves: 1) tall buildings, 2) short buildings How do the following respond to unconsolidated material vs rock (bedrock): 1) tall buildings, 2) short buildings
* Great earthquake:
* megathrust earthquake:
* What is magnitude?
  + What is the difference between the Richter Magnitude and Moment Magnitude scales?
  + How is magnitude calculated with each scale (in general)?
* A 7.0 is\_\_\_\_\_times more intense, regarding **ground shaking**, than a 6.0. However, releases \_\_\_\_\_ times more **energy.**
* What is the modified Mercalli Scale?
  + How does this scale differ from the magnitude scale?
  + What is a shake map?
* What is triangulation? which seismic waves are used?

**EQ HAZARDS**

* What are some hazards associated with earthquakes? What was emphasized for each hazard in class?
* Name 2 poor (weak during ground shaking) building materials?
* 2 building designs to minimize movement during EQ
* Conditions for **Liquefaction** to occur? Type of “earth material”? Why such a common hazard?

**TSUNAMI**

* Disturbing forces? How are the waves generated?
* Why more common in the Pacific Ocean?
* Why more destructive than wind waves?
* What is the average wave height and wavelength in the open ocean?
* How far and fast can they travel?
* Is there only one wave?
* How does the wave change as it approaches a coast? (length, height, and velocity)
* Understand how the waves are generated during subduction zone earthquakes (how does ocean floor move during megathrust EQ?

**TSUNAMI EVENTS:**

* + What type of plate boundary are the locations below associated with? Know tsunami was the main hazard. What else was emphasized for each event? All below formed in response to a megathrust EQ **except?**
    - Alaska 1964; Chile (S.A.) 1960; Cascadia Subduction Zone; Indonesia (Indian Ocean) 2004; Krakatau, Indonesia 1883; Japan, 2011.
  + Be familiar with the **other** possible Tsunami events: **1)** Pacific Ocean, **2)** southern CA, and **3)** Atlantic Ocean.

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**Earthquake Events:**

* **Know the type of plate boundary** **and/or fault** (if name mentioned) **for each** of the following events and the **hazards/** **essential information emphasized in lecture**: Izmit, Turkey, 1999; Haiti, 2010; San Francisco, 1906; Loma Prieta, 1989; Northridge, 1994; Baja 2010; China, 1976 and 1975; Alaska, 1964; Mexico City, 1985; Chili, South America 1960; Tokyo Japan, 1923; Indonesia, (Indian Ocean) 2004; Iran; Pakistan, 2005; Sichuan China, 2008; Nepal, 2015; New Madrid earthquakes, 1811-12 . Which subduction events are located in the Ring of Fire*?* :

**San Andreas Fault (SAF):**

* Where does the **San Andreas Fault (SAF)** continue offshore along the northern and southern ends? Where is the SAF in relation to San Diego, LA, and San Francisco?
* Type of fault? Which plates are on either side?
* What type of plate boundary was CA before the SAF? When did the plate boundary change (how many millions of yrs ago)?
* What is a batholith? How does it form? Is there one in CA? Where? Name? Why discussed?
* Where is the Hayward Fault? Why mentioned? Location relative to San Andreas Fault and S. CA faults?
* 2 earthquake events in the bay area? What was emphasized in class?
* What is Paleoseismology? What do scientists do? Why is this field method important?
* What is Recurrence Interval?
* Where is the “creeping section” relative to the Bay area and the Mojave section? …say “in between”
* What and where is the “Big Bend”? Type of stress here? Evidence for this stress in LA *and Santa Barbara*? Can you illustrate why this secondary stress develops? Understand the discussion about the “Big Bend” and how it affects Los Angeles.
* What type of fault is the Puente Hills fault and why? Where is this fault? (blind-yes…classification?)
  + Northridge earthquake: where in CA and type of fault?
* Great earthquake (almost, ~ 7.9) on the SAF…where? Which segment of the SAF ruptured during this almost great earthquake event?
* The Coachella segment is a concern. Why? (see animation) Where is this segment on the SAF?
* Where is the Rose Canyon Fault? Know order of faults going west to east, or reverse: Rose Canyon Fault, Elsinore Fault, San Jacinto Fault, and SAF. What type of faults are these?
* What was emphasized in class about the San Jacinto Fault, the Rose Canyon Fault?
* Where is the Rose Canyon fault? Mt Soledad—why uplift?
* Earthquakes in Interior U.S.:
  + Basin and Range (B&R): where is this region relative to CA (state to remember)?
  + Eastern California Shear Zone: where in general? why mentioned?
  + Wasatch Mountains--type of stress and faults in this region? Where is this Range relative to the B&R?
  + New Madrid Fault zone: Where is this? significant earthquakes? Why?
  + Which area of the U.S. was mentioned during the Fracking discussion? Why do earthquakes occur in response to fracking?

#### **VOLCANOES:**

* Volcanic rocks are classified as \_\_\_\_\_\_\_\_\_ rocks.
* Understand the difference between basaltic eruptions (which tectonic settings?) and andesitic/rhyolitic eruptions (tectonic setting?).
* What are the two most common elements in the crust? Which 2 elements are always found in minerals that make up volcanic rocks?

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* **Be familiar with the following terms and the type of tectonic setting (divergent, subduction, or hot spot) they are associated with (terms are underlined):** high viscosity, low viscosity, shield volcano, composite volcano (stratovolcano), pahoehoe flow, aa flow, lava tube, fissure eruptions, pyroclastic flow, pyroclastics or tephra (bombs, pumice, ash, blocks), lahar, lava dome, plinian eruption, eruption column, flood basalts, crater, caldera, composition of ocean crust; igneous rocks; volcanic explosivity index (VEI); resurgent dome

##### Viscosity: what controls this? How does this play a role in style of eruption?

* What are some precursors to eruptions? (warning signs of an eruption occurring in near future)
* Major gases emitted from volcanoes? Which gas is responsible for global cooling? global warming? Understand how these gases cause warming and cooling.

Past Eruptions: know importance of each event (main hazards, etc.) and the tectonic setting (also geographic location, such as Pacific NW, Caribbean, Indonesia, Mediterranean, etc.):

* Mt. St. Helens 1980; Mt. Rainier; Mt. Mazama/Crater Lake; Mt. Shasta
* Mt. Pinatubo, Philippines 1991; Nevado del Ruiz, Columbia South America 1985; El Popo, Mexico City
* Krakatau, Indonesia 1883; Anak Krakatau; Tombora, Indonesia 1815; Merapi, Indonesia 2010
* Caribbean (do not have to know any events)
* Vesuvius, Italy 79 AD
* Long Valley Caldera, CA;Yellowstone Caldera
* Iceland; Kilauea on the Big Island of Hawaii (how many shield volcanoes?),
* Where is the Cascade Range? Which volcanoes (from above) are located in the Cascade Range?
* Which, from above, are located in the Ring of Fire? Remember subduction locations you learned for Exam 1
* **Be able to recognize the following on a map or place on a map: 1)** San Andreas F. **2)** Rose Canyon Fault **3)** Elsinore and San Jacinto Fault **4)** Sierra Nevada Batholith (Long Valley Caldera, CA) **5)** Peninsular Ranges Batholith (mountains east of SD and orange county) **6)** Hayward Fault **7)** Basin and Range (Nevada) **9)** Puente Hills Fault **10)** Eastern California Shear Zone, **11)** Wasatch Mountains, **12)** Cascade arc, **13)** Yellowstone, **14)** New Madrid Fault zone. ☺